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"A Study of Prevalence of Vitamin D Deficiency in Pregnant Women Attending Antenatal OPD at BHMRC"

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Abstract
Background and purpose: *For the past few years various observational and interventional trials have been conducted all over the world regarding health implication of vitamin D status and their supplementation. Through this study we plan to look for the prevalence of vitamin D deficiency in pregnant women in Indian scenario and maternal and fetal outcome in pregnant women with vitamin D deficiency.*
Method: *The present study was conducted in the Department of Obstetrics and Gynaecology, Batra Hospital and Medical Research centre, New Delhi from 1st January 2013 to 31st December 2013. A total of 100 subjects were recruited in this study, 50 booked patients and 50 unbooked patients. All subjects were evaluated on the basis of predesigned and pretested proforma with respect to history, clinical examination and ultrasonography. Serum samples of all subjects were taken for assessment of vitamin D levels..*
Results: *A total of 40% patients had severe vitamin D deficiency, 34% amongst booked and 46% amongst unbooked patients. 15.85% of vitamin D deficient patients developed gestational hypertension while only 11.11% of vitamin D sufficient patients, 20.73% of Vitamin D deficient females developed GDM while only 5.56% patients with normal vitamin D levels. 4.88% of vitamin D deficient females developed PPROM while none of the females with normal vitamin D levels developed PPROM, while Overall 40% newborns had severe vitamin D deficiency at birth, 32% of newborns of booked patients and 48% of newborns of unbooked patients had severe vitamin D deficiency. 32.92% newborns of vitamin D deficient females were LBW while only 16.67% newborns of females with normal vitamin D levels were LBW. A higher incidence of LBW was observed in females with severe vitamin D deficiency (47.5%) compared with mild to moderate deficiency (19.04%).A higher incidence of SGA was observed in females with severe vitamin D deficiency (27.5%) compared with mild to moderate deficiency (15.16%).*
Interpretation :*The present study supports the paradox of prevalent vitamin D deficiency in Indian pregnant women despite abundant sunshine. This study concludes that severe vitamin D deficiency is a risk factor for adverse pregnancy outcome (gestational hypertension, gestational diabetes mellitus and fetal growth restriction) and also supports that vitamin D supplementation during antenatal period improves neonatal vitamin D status as well as fetal outcomes*

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I. Introduction

Vitamin D is an essential prohormone which is synthesized in skin under effect of ultraviolet light from sunshine. After double hydroxylation in the body it gets converted into an active form which maintains calcium level in the blood. Other than skeletal system, vitamin D is essential for various functions in body like cardiovascular health, neurodevelopment, and regulation of cell growth and immunomodulatory actions too.[1,2]
In the recent years of fastest growing economy, era of urbanisation and socioeconomic transformation vitamin D deficiency has emerged as a pandemic of modern world. Vitamin D has received worldwide attention not only for its importance for bone health in children and adults but also for reducing risk of many chronic diseases including autoimmune diseases, type 2 diabetes, heart disease, infectious diseases and many cancers.[3,4]
Prevalence of vitamin D deficiency in various studies has been estimated to be 50-60%.[6]India being a vast tropical country extending from 8.4^0 N latitude to 37.6^0 N latitude, receiving ample sunlight throughout the year but prevalence of vitamin D deficiency is unexpectedly high even in this country of abundant sunshine. This paradox may be partly explained by the prevalent social and cultural practices in India that preclude adequate exposure of young women to sunshine. Increasing urbanization that resulted in poor outdoor activity and greater pollution, coupled with skin pigmentation, may further compound this problem.

Vitamin D has emerged as an important regulator and determinant of pregnancy and child health. It regulates placental development and function, which suggests that maternal vitamin D status may be associated with adverse outcomes of pregnancy such as miscarriage, preeclampsia,intrauterine growth retardation (IUGR) and preterm birth. The active form of vitamin D, 1, 25-dihydroxyvitamin D3, has been shown to regulate the transcription and function of genes associated with placental invasion, normal implantation and angiogenesis.[7] Low vitamin D levels have been linked to bacterial infections in the vagina in first trimester of pregnancy. This can increase the risk of preterm birth and adverse pregnancy outcomes. There is one study that associates a four times greater risk of caesarean section with women that have low vitamin D levels believed to be due to the fact that skeletal muscle contains vitamin D receptors and deficiency can result in muscle weakness and poor strength in labour.[8]

In the first 6-8 weeks of postnatal life, the vitamin D status of a neonate is dependent largely on the vitamin D that is acquired through placental transfer in utero. According to numerous investigators, 25(OH)D concentrations in umbilical cord at the time of delivery range from 68% to 108% of maternal levels.[9] Low vitamin D levels during pregnancy may account for reduced fetal growth and altered neonatal development. Recent studies showed that compared with women having adequate vitamin D levels, women with deficient vitamin D levels had infants with lower birth weights and a higher risk of SGA. In utero or early life vitamin D deficiency has been linked to an increased risk of type 1 diabetes, asthma and schizophrenia in later life.

Vitamin D deficiency during pregnancy is a worldwide epidemic. Prevalence of vitamin D deficiency in India is significant, eighty four percent of women (84.3% of urban and 83.6% of rural women) had 25(OH)D values below the cut off considered adequate(<22.5ng/ml). Seventy four percent of pregnant women had vitamin D deficiency.[10]

For the past few years various observational and interventional trials have been conducted all over the world regarding health implication of vitamin D status and their supplementation. Through this study we plan to look for the prevalence vitamin D deficiency in pregnant women in Indian scenario and maternal and fetal outcome in pregnant women with vitamin D deficiency. A confirmation of vitamin D deficiency as a risk factor for adverse maternal and fetal outcome would be of great *health impact as it can be prevented by supplementation of vitamin D.*

II. Material And Methods

Study Area: The study was conducted in the Department of Obstetrics and Gynaecology, Batra Hospital & Medical Research Centre, New Delhi.

Population: Women attending antenatal clinic and delivering between 1st January 2013 to 31st December 2013 at Batra Hospital & Medical Research Centre.

III. Selection criteria

Exclusion Criteria:

1. Multi fetal gestation.
2. Known diabetes, hypertension, thyroid dysfunction or other comorbid conditions e,g. heart disease, renal disease etc.
3. Not willing to participate in the study.
4. Planning to be delivered at another hospital.

Inclusion criteria:

1. All booked pregnant women attending antenatal clinic and delivering at Batra Hospital and Medical Research Centre, New Delhi during the study period.
2. All unbooked pregnant women delivering in Batra Hospital and Medical Research Centre, New Delhi during the study period.

Sample Size: 100 pregnant women (50 booked women & 50 unbooked) delivering at Batra Hospital and Medical Research Centre, New Delhi.

Methodology:1st Group: 50 pregnant women were randomly selected during the study period, which were registered in antenatal clinic during first trimester of pregnancy, satisfying the inclusion criteria in the study. Clinical evaluation was done using a predesigned and pretested proforma with respect to history, clinical examination, biochemical parameters and ultrasonography. Serum vitamin D levels (Table 1) were estimated at first visit along with all other routine antenatal investigations as per hospital antenatal protocol. All subjects recruited for study were followed up till delivery the antenatal clinic in a routine manner, as per the hospital antenatal protocol. Frequency of follow up visit was 4 weekly till 28 weeks, 2 weekly till 36 weeks and weekly thereafter. All subjects with vitamin D deficiency were given vitamin D supplementation in the form of 60000 IU weekly for 3weeks and the 1000 IU daily till delivery. The subjects developing gestational hypertension, preeclampsia, gestational diabetes mellitus and intrauterine fetal growth restriction were managed as per hospital protocol.

2nd Group: 50 pregnant women unbooked at Batra Hospital satisfying the inclusion criteria, who came for delivery during the study period, were randomly included in the study. Clinical evaluation was done using a predesigned and pretested proforma with respect to history, clinical examination, biochemical parameters. Serum vitamin D levels were estimated at the time of admission at our hospital. Adverse maternal outcomes like gestational hypertension, preeclampsia, gestational diabetes mellitus and intrauterine growth restriction were evaluated and managed. After delivery neonatal vitamin D levels were estimated in both groups and fetal outcomes were noted like birth weight, small for date(SFD), low birth weight (LBW) in both groups.

IV. Variables Studied

1. **Independent variables of study**:
a. Age
b. Parity
c. Religion
d. Socioeconomic Status
2. **Outcome Variables**
a. Maternal Vitamin D level on first visit in both groups.
b. Maternal outcomes like gestational hypertension, gestational diabetes mellitus, preeclampsia, intrauterine growth restriction, PROM
c. Neonatal vitamin D levels at birth in both groups
d. Fetal outcomes like birth weight

V. Statistical Methods Employed

Data was collected, compiled, analysed and valid conclusions were drawn. Data collected during the study was tabulated in Microsoft Excel. For all quantitative variables mean, median and standard deviation was calculated. Means were compared using Student's t-test for two groups. All qualitative variables were described as frequencies and proportions. Proportions were compared using Chi square or Fisher's exact test, if applicable.

VI. Results (Table 2)

- The mean age in booked group was 26.36±4.08 years and in unbooked was 25.88±3.99 years.
- A total of 82% of females were vitamin D deficient, 39% amongst booked patient and 43% amongst unbooked patients.
- Mean vitamin D of booked patients was 18.15±2.43ng/ml and of unbooked patients was 13.24±1.56ng/ml.

Table:1 Cut-Off Value Of 25(Oh)D Level For Definition Of Vitamin D Deficiency

Vitamin D deficiency	serum 25(OH)D <30ng/ml
Severe vitamin D deficiency	serum 25(OH)D <10ng/ml
Vitamin D inadequacy	serum 25(OH)D 30-49.99ng/ml
Vitamin D sufficient	serum 25(OH)D 50-74.99ng/ml
Vitamin D toxicity	serum 25(OH)D >125ng/ml

- A total of 40% patients had severe vitamin D deficiency, 34% amongst booked and 46% amongst unbooked patients.
- All booked patients received vitamin D supplementation while only 36% unbooked patients received vitamin D supplementation.
- 15.85% of vitamin D deficient patients developed gestational hypertension while only 11.11% of vitamin D sufficient patients.
- A higher incidence of gestational hypertension was observed in patients with severe vitamin D deficiency (22.5%) compared to mild to moderate vitamin D deficiency (9.52%).
- 20.73% of Vitamin D deficient females developed GDM while only 5.56% patients with normal vitamin D levels.
- A higher incidence of GDM was observed in patients with severe vitamin D deficiency (27.5%) compared to mild to moderate vitamin D deficiency (14.28%).
- 4.88% of vitamin D deficient females developed PPROM while none of the females with normal vitamin D levels developed PPROM.
- A higher incidence of PPROM was observed in patients with severe vitamin D deficiency (7.5%) compared to mild to moderate vitamin D deficiency (2.38%).
- 23.17% of vitamin D deficient females developed IUGR while 16.67% of th

TABLE 2: Shows the value of different variables included in study compared for each group

VARIABLE	VITAMIN D DEFICIENCY	
	YES	NO(SUFFICIENT)
GESTATIONAL HYPERTENSION	15.85%	11.11%
GDM	20.73%	5.56%
PPROM	4.88%	0.0%
IUGR	23.17%	16.67%
LBW	32.92%	16.67%
SGA	21.96%	11.11%

- females with normal vitamin D levels developed IUGR
- A higher incidence of IUGR was observed in patients with severe vitamin D deficiency (32.5%) compared to mild to moderate vitamin D deficiency (14.28%). This difference was **statistically significant** (P=0.04).
- Mean vitamin D of newborns of booked females was 22.37±1.82ng/ml and that of unbooked females was 15.19±1.84ng/ml. The difference between the two groups was **statistically highly significant.**
- Overall 40% newborns had severe vitamin D deficiency at birth, 32% of newborns of booked patients and 48% of newborns of unbooked patients had severe vitamin D deficiency.
- 32.92% newborns of vitamin D deficient females were LBW while only 16.67%
- newborns of females with normal vitamin D levels were LBW.
- A higher incidence of LBW was observed in females with severe vitamin D deficiency (47.5%) compared with mild to moderate deficiency (19.04%) and this difference was **statistically highly significant (P=0.006).**
- 21.96% of newborns of females with vitamin D deficiency were SGA while only 11.11% newborns of females with normal vitamin D levels were SGA.
- A higher incidence of SGA was observed in females with severe vitamin D deficiency (27.5%) compared with mild to moderate deficiency (15.16%).
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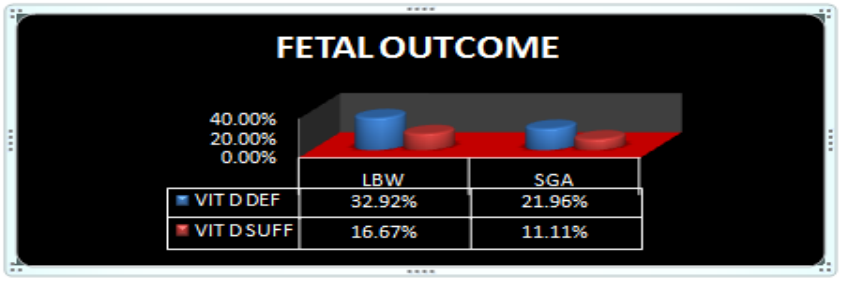
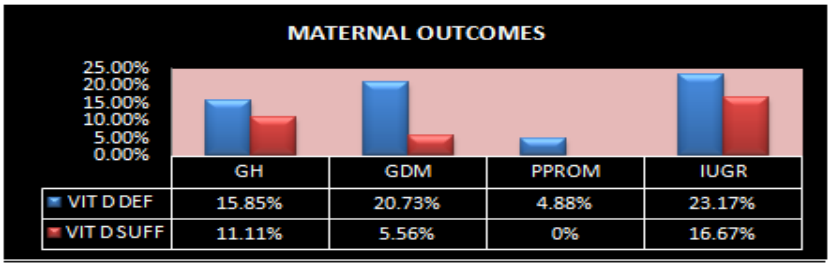
VII. Discussion

1. ThepresentstudysupportstheparadoxofprevalentvitaminD
2. deficiency in Indian pregnant women despite abundant sunshine.
3. t also supports the association of maternal vitamin D deficiency with pregnancy outcomes. This study concludes that severe vitamin D deficiency is a risk factor for adverse pregnancy outcome (gestational hypertension, gestational diabetes mellitus and fetal growth restriction).
4. Present study also supports that vitamin D supplementation during antenatal period improves neonatal vitamin D status as well as fetal outcomes.
5. However randomised controlled trials are needed regarding vitamin D supplementation and effect on pregnancy outcomes to establish a casual relationship between vitamin D deficiency and pregnancy outcomes.





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